Advanced Research Projects Agency • ENERGY

HEATS PROJECT

MIT

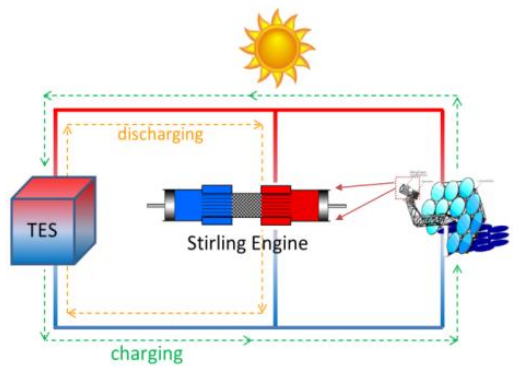
EFFICIENT HEAT STORAGE MATERIALS

PROJECT TITLE:	Metallic Composites Phase-Change Materials for High-Temperature Thermal Energy Storage
ORGANIZATION:	Massachusetts Institute of Technology (MIT)
LOCATION:	Cambridge, MA
PROGRAM:	HEATS
ARPA-E AWARD:	$874,679
TECH TOPIC:	Concentrated Solar & Nuclear Power
PROJECT TERM:	11/21/11 – 11/20/14
WEBSITE:	www.arpa-e.energy.gov/ProgramsProjects/HEATS.aspx

CRITICAL NEED

There is a critical need to find efficient, cost-effective thermal energy storage solutions to maximize the use of domestic solar and nuclear energy resources. Most utility-scale solar power plants only run at about 25% of their capacity because they can't generate power at night—thermal energy storage makes it possible to increase this capacity to up to 60-75%. Similarly, nuclear power plants produce a constant output of power—thermal energy storage could help increase this output during times of critical peak demand.

PROJECT INNOVATION + ADVANTAGES



MIT is developing efficient heat storage materials for use in solar and nuclear power plants. Heat storage materials are critical to the energy storage process. In solar thermal storage systems, heat can be stored in these materials during the day and released at night—when the sun's not out—to drive a turbine and produce electricity. In nuclear storage systems, heat can be stored in these materials at night and released to produce electricity during daytime peak-demand hours. MIT is designing nanostructured heat storage materials that can store a large amount of heat per unit mass and volume. To do this, MIT is using phase change materials, which absorb a large amount of latent heat to melt from solid to liquid. MIT's heat storage materials are designed to melt at high temperatures and conduct heat well—this makes them efficient at storing and releasing heat and enhances the overall efficiency of the thermal storage and energy-generation process. MIT's low-cost heat storage materials also have a long life cycle, which further enhances their efficiency.

IMPACT

If successful, MIT would reduce the cost of thermal energy storage systems by almost 75%.

- SECURITY: Cost-effective thermal energy storage would enable increased use of domestic energy resources like solar and nuclear —strengthening the nation's energy security.
- ENVIRONMENT: Cost-effective thermal energy power generation could help decrease fossil-fuel-based electricity use and harmful emissions from coal-burning power plants.
- ECONOMY: Thermal energy storage systems could make it less expensive to generate power from nuclear and renewable solar energy, which in turn could help stabilize electricity rates for consumers.
- JOBS: Widespread use of advanced energy storage technologies could create jobs in engineering, manufacturing, and construction to support the development of utility-scale solar and next-generation nuclear energy plants.

CONTACTS

ARPA-E Program Director:
Dr. Ravi Prasher,
ravi.prasher@hq.doe.gov

Project Contact:
Dr. Gang Chen,
gchen2@mit.edu

Partner Organization:
Boston College